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## Part II

### Department of Labor

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Mine Safety and Health Administration

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30 CFR Parts 56 and 57

Safety Standards for Explosives at Metal  
and Nonmetal Mines; Final Rule

**DEPARTMENT OF LABOR****Mine Safety and Health Administration****30 CFR Parts 56 and 57**

RIN 1219-AA84

**Safety Standards for Explosives at Metal and Nonmetal Mines****AGENCY:** Mine Safety and Health Administration, Labor.**ACTION:** Final rule.

**SUMMARY:** This final rule revises certain provisions of the Mine Safety and Health Administration's (MSHA) safety standards for explosives at metal and nonmetal mines. The final rule revises existing standards for separation of detonators from other explosives or blasting agents during storage in powder chests and during transportation. Additionally, it revises existing provisions related to loading and blasting of explosive materials. The final rule also expands the application of existing provisions concerning the protection of explosive materials from impact and exposure to high temperatures, and it revises and clarifies the existing provisions addressing static electricity dissipation during loading. The rule revises the existing preamble discussion for vehicles containing explosive material, and incorporates existing blast site security provisions into the loading and blasting standards. For the convenience of the mining community, MSHA has published the full text of the explosives standards for metal and nonmetal mines in this Federal Register document.

**EFFECTIVE DATES:** This final rule is effective September 10, 1996. The incorporation by reference listed in the regulations is effective September 10, 1996.

**FOR FURTHER INFORMATION CONTACT:** Patricia W. Silvey, Director, Office of Standards, Regulations, and Variances, MSHA, 703-235-1910.

**SUPPLEMENTARY INFORMATION:****I. Paperwork Reduction Act**

Under final §§ 56/57.6306(a), operators must either attend; barricade and post the blast site with warning signs, such as "Danger," "Explosives," or "Keep Out;" or flag the blast site against unauthorized entry. These final requirements for use of warning signs, such as "Danger," "Explosives," or "Keep Out," are not considered information collection under the Paperwork Reduction Act of 1995 (PRA 95) and are not subject to approval by the Office of Management and Budget (OMB).

Final §§ 56/57.6306(d) requires that operators conduct loading and blasting in a manner to facilitate a continuous process so that the blast is fired as soon as possible. The final standard does not retain the concept of "undue delay", but retains the existing requirement to notify MSHA of blasting delays beyond 72 hours. MSHA estimates that these provisions affect fewer than 10 respondents annually, all large mines. Although notification is considered an information collection burden under PRA 95, this provision is not subject to OMB approval because it affects fewer than 10 respondents annually.

**II. Rulemaking Background**

MSHA published comprehensive revisions to its explosives safety standards for metal and nonmetal mines in January 1991 (56 FR 2070). Prior to the effective date of the rule, MSHA stayed several provisions due to compliance issues raised by the mining community and explosives manufacturers. The provisions involved were subsequently repropounded on October 16, 1992 (57 FR 47524) for revision and clarification. On December 30, 1993, MSHA published the existing final rule which became effective on January 31, 1994 (58 FR 69596).

In February 1994, the American Mining Congress (AMC) and the Institute of Makers of Explosives (IME) each filed a petition for review of the final rule with the United States Court of Appeals for the District of Columbia Circuit, in *American Mining Congress v. MSHA*, Docket No. 91-1124 and 91-1568, consolidated cases, and in *IME v. MSHA*, Docket No. 94-1144. AMC requested that MSHA reconsider evidence in the rulemaking record regarding the continuous loading requirements of §§ 56/57.6306(c), *Loading and blasting*. In addition, AMC requested that the Agency clarify the preamble discussion to §§ 56/57.6202(a)(1), concerning vehicles containing explosive materials.

IME suggested revision of §§ 56/57.6000, the definition of "laminated partition," and corresponding changes in §§ 56/57.6133(b), *Powder chests*, and §§ 56/57.6201(a)(2) and (b)(2), *Separation of transported explosive material*. Also, IME requested that MSHA reconsider information in the rulemaking record regarding the requirements of §§ 56/57.6602, *Static electricity dissipation during loading*.

In response to the issues raised by the mining industry and explosive manufacturers, MSHA issued Program Policy Letter No. P94-IV-3 on September 30, 1994. This Program Policy Letter provided information to

the mining community regarding the proper usage of the IME-22 Container as a "laminated partition" under §§ 56/57.6000, §§ 56/57.6133, and §§ 56/57.6201. The Agency also interpreted the "continuous loading" requirements of §§ 56/57.6306; clarified the meaning of the term "good condition" as it applies to vehicles used in §§ 56/57.6202; clarified the application of §§ 56/57.6501 regarding double trunklines or loop systems when using low energy detonating cord with inhole delays; and interpreted §§ 56/57.6602(e) on static electricity dissipation during loading as it applies to the use of plastic hole liners. This final regulation addresses these regulatory issues except for §§ 56/57.6501 regarding double trunklines or loop systems. Therefore, Program Policy Letter No. P94-IV-3 will expire on the effective date of this final regulation.

On January 5, 1995, MSHA published a proposed rule in the Federal Register (60 FR 1866) which would have revised the provisions discussed above. Public hearings were held in Cleveland, Ohio, and Elko, Nevada in July 1995. The rulemaking record closed on August 18, 1995. MSHA received and reviewed written and oral statements on the proposed rule from all segments of the mining community. These final standards for explosives at metal and nonmetal mines are based on consideration of the entire rulemaking record, including all written comments and exhibits received related to the January 1991 and the December 1993 final regulations, as well as the January 5, 1995, proposal and the public hearing record.

To serve the interests of the mining community, MSHA has republished the full text of subpart E of 30 CFR parts 56 and 57 as they will read effective September 10, 1996. This final rule, however, addresses revisions only to the following sections. Sections republished here and not on the list below are unchanged.

**Parts 56 and 57**

§§ 56/57.6000	Definitions.
§§ 56/57.6133	owder chests.
§§ 56/57.6201	Separation of transported explosive material.
§§ 56/57.6202	Vehicles.
§§ 56/57.6302	Separation of explosive material.
§§ 56/57.6306	Loading, blasting, and security.
§§ 56/57.6313	Blast site security.
§§ 56/57.6602	Static electricity dissipation during loading.

§§ 56/57.6905 Protection of explosive material.

### III. Discussion and Summary of the Final Rule

#### A. General Discussion

Historically, hazards associated with the storage, transportation, and use of explosive materials have caused or contributed to serious injuries and fatalities in metal and nonmetal mines. Precautions to safeguard against these hazards are an essential part of any effective mine safety program. The standards in 30 CFR parts 56 and 57, subpart E, focus on hazards associated with using or working near explosive materials at metal and nonmetal mines. The standards in this final rule clarify and address certain precautions necessary to prevent the hazards common to storing, transporting, and handling explosive materials. These standards also address the issues raised in the rule challenges noted above.

#### B. Organizational Changes

Paragraph (b) of existing §§ 56/57.6302 is moved to §§ 56/57.6905 of this subpart. Paragraph (a) of existing §§ 56/57.6302 requires that explosives and blasting agents be kept separate from detonators until loading begins. This provision remains unchanged. The section heading of §§ 56/57.6302 is revised in the final rule to read "*Separation of explosive material.*"

Paragraph (b) of existing §§ 56/57.6302 requires that explosive material be protected from impact and temperatures in excess of 150 degrees Fahrenheit when taken to the blast site.

In 1993, MSHA promulgated §§ 56/57.6302 under the "Use" portion of the explosives regulation, thereby inadvertently creating confusion as to whether explosives also must be protected from impact during transportation and storage. MSHA's intent was to require protection of explosive material from impact and high temperatures generally, not just during use. This final rule moves existing paragraph (b) of §§ 56/57.6302 to "*General Requirements*" and "*General Requirements-Surface and Underground.*" The provision is codified as §§ 56/57.6905, with the section heading "*Protection of explosive material.*"

#### C. Deletions

Existing §§ 56/57.6313, which require that areas where loading is suspended or loaded holes are awaiting firing be attended, barricaded and posted, or flagged against unauthorized entry are deleted, and these requirements are

incorporated into final §§ 56/57.6306(a) for loading and blasting.

#### D. Incorporations by Reference

Existing §§ 56/57.6000, §§ 56/57.6133, and §§ 56/57.6201 incorporate by reference the definition of "laminated partition" and recommendations found in the IME Safety Library Publication No. 22, "Recommendations for the Safe Transportation of Detonators in a Vehicle with other Explosive Materials," (May 1993), and "The Generic Loading Guide for the IME-22 Container," (October 1993). Whenever a laminated partition is used under the final rule, IME's recommendations contained in these two publications must be followed. As discussed below, MSHA will make these IME publications available to the mining community.

#### E. Section-by-Section Analysis

The following section-by-section analysis explains the final rule and its effect on existing standards. The standards in part 56 apply to all surface metal and nonmetal mines; those in part 57 apply to underground and surface areas of underground metal and nonmetal mines.

§§ 56/57.6000 *Definitions.*

§§ 56/57.6133 *Powder chests.*

§§ 56/57.6201 *Separation of transported explosive material.*

Sections 56/57.6133 and 56/57.6201 address the hazards of unplanned detonation of explosives when stored and transported. The separation requirements are intended to impede propagation should detonators be initiated.

The existing definition of "laminated partition" in 30 CFR §§ 56/57.6000 includes the combinations of materials which must be used in a partition if operators choose to store or transport certain detonators with explosives or blasting agents. These dimensions are based on IME Safety Library Publication No. 22, "Recommendations for the Safe Transportation of Detonators in a Vehicle with other Explosive Materials," (May 1993), and the "Generic Loading Guide for the IME-22 Container," (October 1993). The term "laminated partition" appears in existing §§ 56/57.6133, *Powder chests*, and in §§ 56/57.6201, *Separation of transported explosive material.*

Existing standards §§ 56/57.6133 require that detonators stored at surface operations and at surface areas of underground operations must be kept in chests separate from other explosives or blasting agents, unless the detonators and explosives or blasting agents are

separated by 4 inches of hardwood or equivalent, or a laminated partition. Similarly, existing §§ 56/57.6201(a)(2) require detonators and other explosives or blasting agents to be transported on separate vehicles or conveyances, except detonators in quantities of more than 1,000 may be transported on the same vehicle or conveyance if maintained in the manufacturer's original packaging, and if separated from explosives or blasting agents by 4 inches of hardwood or equivalent, or a laminated partition. The 4 inches of hardwood or equivalent must be fastened to the vehicle or conveyance. Paragraph (b)(2) of §§ 56/57.6201 allows detonators in quantities of 1,000 or fewer to be transported with explosives or blasting agents when kept in closed containers and separated by 4 inches of hardwood or equivalent, or a laminated partition. The 4 inches of hardwood or equivalent must be fastened to the vehicle or conveyance.

The Institute of Makers of Explosives (IME) raised objections to these existing regulations since the IME safety guidelines warn against hazards associated with use of the IME-22 container when transporting detonators with other explosives and blasting agents on the same vehicle.

Proposed §§ 56/57.6000 included language similar to that of the existing regulation. Proposed §§ 56/57.6133(b) would have allowed operators the flexibility to continue storing detonators with other explosives and blasting agents in a powder chest (day box) when separated by 4 inches of hardwood or equivalent. Likewise, proposed §§ 56/57.6201 (a)(2) and (b)(2) would have allowed operators to continue transporting detonators with explosives and blasting agents on the same vehicle or conveyance if they are separated by 4 inches of hardwood or equivalent. In response to IME's comments, both proposed standards also would have allowed use of a laminated partition to separate detonators from explosive materials, provided operators followed guidelines included in the IME Safety Library Publication No. 22, "Recommendations for the Safe Transportation of Detonators in a Vehicle with other Explosive Materials," (May 1993), and the "Generic Loading Guide for the IME-22 Container" (October 1993) when using a laminated partition.

Final regulations for §§ 56/57.6000 are the same as the proposed rule. The final regulations for both §§ 56/57.6133(b) and §§ 56/57.6201 (a)(2) and (b)(2) parallel the proposed rules in that they permit the longstanding practice of using 4 inches of hardwood or

equivalent, or a laminated partition (which includes the IME-22 Container or box) to separate detonators from other explosives or blasting agents, provided that the provisions of the IME Safety Library Publication No. 22, "Recommendations for the Safe Transportation of Detonators in a Vehicle with other Explosive Materials," (May 1993), and the "Generic Loading Guide for the IME-22 Container" (October 1993) are followed. Copies of these IME publications are available to the mining industry at MSHA headquarters in Arlington, VA, and at all Metal and Nonmetal Mine Safety and Health district offices.

MSHA did not receive any comments relative to the Agency's definition of the term "laminated partition" as described in the proposed rule.

One commenter objected to MSHA incorporating by reference IME publications stating that such incorporation would interfere with the opportunity to comment on the content of these publications. MSHA has historically relied upon manufacturers' design specifications and recommendations for the proper use of specific mining equipment and machinery where unintended use of such equipment and machinery poses a serious safety hazard to miners. Therefore, if operators use a laminated partition for compliance with standards §§ 56/57.6133 and §§ 56/57.6201, they must follow the guidelines prescribed in IME's accompanying documentation, including updated revisions where applicable. MSHA expects that the IME will periodically update this documentation, and MSHA intends to give mine operators adequate notice should compliance changes become necessary.

Some commenters sought clarification of the phrase "4 inches of hardwood, or equivalent," as used in proposed §§ 56/57.6133 and §§ 56/57.6201, while other commenters requested that MSHA define the term "equivalent" in the final regulation to specify the types of or combinations of materials that would be accepted. "Equivalent" under the final rule refers to any barrier, other than a laminated partition, that provides at least the same degree of protection for explosives or blasting agents as 4 inches of hardwood should detonators be initiated by outside forces. Presently, MSHA has no equivalency data to convert the degree of protection provided by hardwood to another material. However, the final standard preserves the flexibility to recognize such future developments.

One commenter requested that MSHA clarify whether "4 inches of hardwood"

refers to a partition separating two containers or to the construction of the detonator box itself. The 4 inches of hardwood or its equivalent refers to the partition used to separate explosives and blasting agents from detonators. The purpose of separation is to impede propagation should detonators be initiated by outside forces. The 4 inches of hardwood or equivalent separator must be fastened inside the cargo area of the vehicle or conveyance containing explosive materials.

At commenters' suggestions, mine operators are reminded that MSHA standards are applicable only to mining property, including transporting of explosive materials. Any transportation of explosive material over public highways is subject to the requirements of the United States Department of Transportation in Title 49 of the Code of Federal Regulations.

#### *Sections 56/57.6202 Vehicles*

Sections 56/57.6202 address the hazard of an unplanned detonation of explosive material during transportation. Detonation can result from vehicle fires, vehicle accidents or construction of an explosive container with inappropriate material.

The existing regulations at §§ 56/57.6202(a)(1) require that vehicles used to transport explosives be maintained in "good condition." MSHA indicated in the preamble discussion to this regulation that for compliance purposes, vehicles must be road-worthy and capable of passing Federal, state, and local licensing requirements for over-the-road use.

MSHA received a number of objections to this interpretation of "good condition." In response to these commenters, MSHA clarifies in this final regulation preamble that for vehicles to be in "good condition" that they comply with the applicable MSHA standards contained in subpart M-Machinery and Equipment, which address requirements for all self-propelled mobile equipment used on mine property. Commenters agreed with this interpretation and MSHA adopts this approach in the final rule.

#### *"USE"*

#### *Sections 56/57.6302 Separation of Explosive Material and Sections 56/57.6905 Protection of Explosive Material*

Sections 56/57.6302 address the hazard of unplanned detonation of explosive material and protection for explosive material during use, transportation, and prior to loading.

Existing paragraph (a) of §§ 56/57.6302 requires that explosives and

blasting agents be kept separate from detonators until loading begins. Existing paragraph (b) requires that explosive material be protected from impact and temperatures in excess of 150 degrees Fahrenheit when taken to the blast site.

When MSHA promulgated existing §§ 56/57.6302, the standards appeared in the "USE" portion of the explosives regulations, although the same hazards also exist during the transportation and storage processes. Therefore, the final rule revises and expands application of existing paragraph (b) of §§ 56/57.6302 to "GENERAL REQUIREMENTS" for both surface and underground, and moves this existing paragraph to newly numbered standards §§ 56/57.6905. Like the proposed regulation, final paragraph (a) requires that operators protect explosive materials against temperatures in excess of 150 degrees Fahrenheit. This temperature threshold is based upon the 1992 Bureau of Mines Information Circular No. 9335, *Blasting Hazards of Gold Mining in Sulfide-Bearing Ore Bodies*; MSHA's Investigation Report No. D7431-S949, *Investigation of Premature Detonations, Paradise Peak Mine*, (December 10, 1991); and the IME Safety Library Publication No. 4, "Warnings and Instructions for Consumers in Transporting, Storing, Handling and Using Explosive Materials," (March 1992), all of which suggest a hazardous change in stability of explosives once temperatures reach this level.

Final paragraph (b) of §§ 56/57.6905, as proposed, requires that explosive material be protected from impact except for tamping and dropping during loading, so long as operators comply with existing requirements of §§ 56/57.6304 for primer protection. For example, large equipment used during the loading process may be capable of exerting forcible impact onto detonating or initiating systems. Also, the proximity of other mining activity may allow equipment to come in contact with explosive loading equipment and explosive containers, thereby exerting impact.

In the proposal, MSHA would have added a new requirement for underground mines to address the hazard of freeing hang-ups in raises, chutes and ore passes. To allow for this type of blasting, the proposal would have permitted only detonating cord to initiate explosives placed in raises, chutes, and ore passes to free hang-ups.

Commenters objected to the proposal as being too restrictive in that it would limit commonly accepted methods of blasting and prohibit application of new technological developments. These commenters stated that the use of

detonating cord as proposed by MSHA may introduce inherent hazards such as fire from the ignition of timber, loosening timber, or other supports, contributing to flyrock, and loosening rib and back. Although MSHA's experience with detonating cord has not resulted in these hazards, the rulemaking record does not contain sufficient support to finalize the proposal. Therefore, the final rule does not adopt the proposal and will continue to permit current conventional practices for freeing hang-ups, provided applicable MSHA safety standards for explosives are followed. These standards, including the requirements of the final rule, provide reasonable protection against unplanned detonation of explosives during hang-up blasting.

*Sections 56/57.6313 Blast Site Security and Sections 56/57.6306 Loading, Blasting, and Security*

The final regulations address the hazard of unplanned detonation of explosives and the presence of unauthorized persons within the blast site, as well as moving vehicles or electrically-powered equipment which could contact and detonate explosive material. The final rule also protects persons working in the blast site from other mining activities unrelated to loading explosives, which can interfere with the loading process and increase the likelihood of an accident.

Existing paragraph (a) of §§ 56/57.6306 prohibits vehicles and other equipment from being driven over explosive material or initiating systems. Existing paragraph (b) allows haulage activity near the base of the highwall being loaded, if no other haulage access exists. MSHA has incorporated existing requirements of §§ 56/57.6313 on blast site security into final §§ 56/57.6306(a). Existing §§ 56/57.6313 require that areas in which loading is suspended or loaded holes are awaiting firing must be attended, barricaded and posted, or flagged against unauthorized entry. The proposal would have revised and expanded application of existing §§ 56/57.6313 by requiring that when explosive materials or initiating systems are brought to the blast site, operators must either barricade and post, or flag the blast site so that unauthorized or inadvertent entry is prevented. Most commenters agreed with the proposal. One commenter objected, however, suggesting that MSHA require identification of the blast site only when the blast site is not attended.

Final §§ 56/57.6306(a) adopts the proposal and includes one revision consistent with existing §§ 56/57.6313

regarding attending the blast site. Under the final standard, operators must either attend; barricade and post the blast site with warning signs; or flag the blast site against unauthorized entry. MSHA has included in the final standard some common examples of the content of warning signs used in the mining industry. In no way does the Agency intend for these examples to be an exclusive list. Operators may use other warning signs for compliance with this provision provided these signs adequately convey to persons that they are entering a hazardous area. MSHA's experience is that these warning signs are universally accepted and are consistent with DOT placards for explosive materials. Once explosives or initiating systems are brought to the blast site, good safety practices dictate that precautions be taken to prevent accidental damage to explosive materials, which can lead to a misfire or accidental detonation. Key among these precautions is delineating the blast site to warn unauthorized persons of the presence of explosives. The provisions of §§ 56/57.6313 were intended to require mine operators to alert other persons working at the mine during loading and blasting operations of the blast site parameters to prevent unauthorized or inadvertent entry onto the blast site. Particularly on a large blast site, persons performing blast-related tasks, such as loading explosives, would not be readily able to warn persons to keep out of the blast site.

One commenter stated that the proposal would result in additional costs to purchase warning signs to barricade, post or flag the blast site. MSHA anticipates that the final rule will result in only nominal cost increases to the mining industry because the posting requirement of final paragraph (a) is an incorporation of existing §§ 56/57.6313, as explained above. Moreover, the final regulation gives operators compliance flexibility by providing alternative methods on how to demarcate the blast site. Under this final regulation, once initiation systems are brought to the blast site, mine operators must either: (1) attend the blast site; (2) barricade and post the blast site with warning signs, such as "Danger," "Explosives," or "Keep Out;" or (3) flag the blast site, to be in compliance with paragraph (a).

In the final rule, existing paragraph (a) of §§ 56/57.6306 becomes paragraph (b) with no substantive change.

Paragraph (c) of final §§ 56/57.6306 restates the existing rule and restricts persons from entering the blast site except those engaged in surveying,

stemming, sampling of geology, and reopening of holes. The final rule, like the proposal, clarifies that haulage activity is permitted near the base of surface highwalls or underground bench faces being loaded or awaiting firing, where no other haulage access exists.

Final paragraph (d) of §§ 56/57.6306 protects against the hazard of periods in which the process of loading and firing explosives is interrupted. In the proposal, MSHA would have added new requirements for all mines to address the potential hazards posed by unauthorized personnel entering a blast site where explosive materials are present. The preamble discussion to the proposed rule stated that persons unfamiliar with the blast site may throw lighted smoking materials into a blast hole, disturb the initiation system, or kick material into a hole—any one of which could contribute to a premature detonation.

Existing paragraph (c) requires that loading be continuous except where adverse circumstances beyond the operator's control necessitate an interruption in loading. Existing paragraph (e) requires that when loading is completed and circuits are connected, operators must blast without undue delay, unless adverse circumstances exist which are beyond the operator's control. The existing standard also requires that operators notify MSHA if such delay could exceed 72-hours. Existing paragraphs (c) and (e) of §§ 56/57.6306 are deleted by the final rule. Hazards addressed under these existing provisions are covered under the final rule in paragraph (d).

Proposed paragraph (d)(1) would have required mine operators to continue the loading and firing process without interruption or undue delay. MSHA gave examples of "undue delay" in the preamble discussion to the proposed standard which included emergencies, unfavorable atmospheric conditions, shift changes and large equipment failures. Also, the proposal would have required operators to attend the mine to prevent unauthorized entry into the blast site.

Commenters indicated that the proposed "attended" requirement was confusing because it could be read to suggest that the physical presence of an individual at the blast site is necessary, contrary to MSHA's definition of the term "attended." Commenters also requested that MSHA clarify the meaning of "undue delay" with a list of circumstances. Other commenters suggested that MSHA clarify that examples listed in the preamble to the proposed standard are not the only justifications for an interruption in the

loading process. In addition, commenters objected to the proposal and to the preamble discussion by stating that past practices in the mining industry have successfully provided protection when loading was interrupted or blasting was delayed, and that no injuries or deaths have been attributed to unattended explosives.

MSHA agrees that there have been no known deaths caused by loaded explosives awaiting blasting. However, explosives technology literature and experience confirm that caution, including reasonable security measures, are appropriate. The final rule therefore adopts an updated version of a previous explosives safety regulation, and continues to permit longstanding practices at larger mining operations which take several days to complete the loading and blasting process.

Final paragraph (d) requires that operators conduct loading and blasting in a manner to facilitate a continuous process so that the blast is fired as soon as possible. The final standard does not retain the concept of "undue delay," but retains the existing requirement to notify MSHA of blasting delays beyond 72 hours. The final standard does not include the proposed requirement that the mine be attended when loading is interrupted or blasting is delayed. MSHA believes that requiring mine operators to load and blast as soon as practicable provides the measure of protection needed for miners by minimizing the loading and blasting exposure time.

Paragraph (d)(2) of §§ 56/57.6306 of the proposed standard would have required that persons securing a blast site at a surface mine or at the surface area of an underground mine withdraw from the blast site during the approach and progress of an electrical storm. The proposal also would have required that persons securing an underground blast site using an electrical blasting system that is capable of being initiated by lightning be withdrawn to a safe location.

Commenters objected to this proposal by stating that it was duplicative of existing §§ 56/57.6604, which provides for the suspension of blasting operations and the withdrawal of persons from the blast area to a safe location during the approach and progress of an electrical storm. MSHA agrees that §§ 56/57.6604 sufficiently addresses the precautions necessary to protect miners from the danger of accidental detonation caused by an electrical storm. Therefore, the final rule does not adopt proposed §§ 56/57.6306.

Paragraphs (f) and (g) of the final rule are unchanged from the existing

regulations. These final rules continue to require that operators institute specific safety measures immediately prior to and after the blasting process. Final paragraph (f) requires, among other things, ample warning, clear escape routes from the blast area, and all access to the blast area to be guarded or barricaded to prevent the passage of persons or vehicles. Numerous accidents have occurred from the failure to clear or prevent unauthorized entry to the blast area. Final paragraph (g) requires post-blast examinations to minimize hazards to persons who will perform subsequent work in the area.

#### "EXTRANEOUS ELECTRICITY"

##### *Sections 56/57.6602 Static Electricity Dissipation During Loading*

This standard addresses the hazard resulting from a buildup of static electricity generated by pneumatic loading, which could cause premature detonation of explosives.

Existing §§ 56/57.6602 require that when explosive material is loaded pneumatically or dropped into a blasthole in a manner that could generate static electricity, an evaluation must be made of potential static electricity hazards and the hazard must be eliminated before loading begins. The standard prohibits the use of wire-countered hoses and plastic tube hole liners where their use could generate static electricity in an amount sufficient to initiate a detonator.

Following publication of the existing rule, MSHA received technical information from commenters suggesting that the scope of the standard is too broad. The term "dropping" encompasses dropping, pouring, or augering explosive materials into blastholes, activities which are performed at a low velocity. As a result, insufficient static electricity is generated to initiate a detonator, and therefore, does not pose a serious hazard. In the proposal, MSHA narrowed the application of this standard by deleting the term "dropping" from the text of existing §§ 56/57.6602.

In response to the proposed revision, a number of commenters indicated that the rule would still include activities which would not generate sufficient static electricity to initiate a detonator. These commenters indicated that the amount of energy required to initiate a detonator should be well-known by the blaster in charge and that blaster is in the best position to make the determination as to when precautions are necessary.

The final rule adopts this approach and requires that certain precautions be

taken only when there is a static electricity hazard.

#### IV. Executive Order 12866 and the Regulatory Flexibility Act

Executive Order 12866 requires that regulatory agencies assess both the costs and benefits of intended regulations. MSHA has determined that this rulemaking is not a significant regulatory action and, therefore, has not prepared a separate analysis of costs and benefits. The Regulatory Flexibility Act requires regulatory agencies to consider a rule's impact on small entities. For the purpose of the Regulatory Flexibility Analysis, MSHA defines a small entity as an operation employing fewer than 20 employees. This final rule would not have a significant economic impact on a substantial number of small entities. The analysis contained in this preamble meets MSHA's responsibilities under Executive Order 12866 and the Regulatory Flexibility Act.

Under the January 5, 1995, proposed rule (60 FR 1866), MSHA estimated that the total annual recurring cost impact would have been about \$70,000. All of these costs were attributable to proposed §§ 56/57.6306(d)(1) which would have required the blast site to be attended if loading was interrupted or firing of the blast was delayed for any reason. MSHA recognizes that it is a safe practice to continuously load explosives and fire them promptly; however, interruptions in loading and delays in firing do occur, particularly in large mining operations. This final rule, therefore, will retain the existing requirements that permit reasonable interruptions in the loading process and require notification to MSHA if blasting of a loaded round will be delayed for more than 72 hours. MSHA estimates that this provision affects fewer than 10 mines annually, but that the mining industry will not incur any additional costs resulting from MSHA's retention of the existing requirements.

The final rule eliminates existing §§ 56/57.6313 and incorporates these requirements for blast site security as §§ 56/57.6306(a) which require that the blast site be attended; barricaded and posted with warning signs, such as "Danger," "Explosives," or "Keep Out;" or flagged against unauthorized entry, when explosives or initiating systems are present. MSHA estimates that final §§ 56/57.6306(a) would affect about 15 small and 60 large mines annually. MSHA anticipates that these provisions primarily would affect quarries; open pit mines, except for certain operations which do not use explosives, such as clay mines and phosphate mines; and large underground mines. MSHA does

not expect small underground mines to be affected as these operations would rarely, if ever, experience the need to leave the blast site unattended when explosive materials or initiating systems are present. Sand and gravel operations and mills rarely blast, and then the blast site is likely to be a single charge, such as that needed to break a large boulder.

Although the scope of this requirement is expanded from when loading is suspended or firing is delayed to apply whenever explosive materials or initiating systems are present at the blast site, MSHA experience is that it is common industry practice to have the blast site attended when explosive materials or initiating systems are delivered and while loading is in progress. Final §§ 56/57.6306(a) address blast site security when explosives are being used. When explosive materials or initiating systems are not being used, other MSHA standards require that they be secured in magazines or other appropriate explosive materials storage facilities. On occasion, however, circumstances, such as delays in loading or firing, may require the blast site to be left unattended when explosive materials are present. In such situations, MSHA expects that mine operators would choose to barricade and post with warning signs, such as "Danger," "Explosives," or "Keep Out," or flag the blast site against unauthorized entry, rather than attend the blast site. One commenter stated that the proposal would result in additional costs to purchase warning signs to barricade, post, or flag the blast site. As this is required under existing §§ 56/57.6313, no new costs are required for compliance with the final rule. MSHA, therefore, has not included an additional cost for this provision in the Regulatory Flexibility Analysis.

#### V. Unfunded Mandates Reform Act

Title II of the Unfunded Mandates Reform Act of 1995, Pub. L. 104-4, requires each Federal agency to assess the effects of Federal regulatory actions on state, local, and tribal governments and the private sector, other than to the extent such actions merely incorporate requirements specifically set forth in a statute. The Agency has determined that this final rule does not impose an unfunded mandate on state and local governments or tribal entities.

#### List of Subjects in 30 CFR Parts 56 and 57

Explosives, Incorporation by reference, Mine safety and health, Reporting and recordkeeping requirements.

Dated: June 26, 1996.

J. Davitt McAteer,

*Assistant Secretary for Mine Safety and Health.*

Parts 56 and 57, subchapter N, chapter I, title 30 of the Code of Federal Regulations are amended as follows:

#### PART 56—[AMENDED]

1. The authority citation for part 56 is revised to read as follows:

Authority: 30 U.S.C. 811.

2. Effective September 10, 1996, subpart E of part 56 is revised to read as follows:

##### Subpart E—Explosives

Sec.

56.6000 Definitions.

##### STORAGE

56.6100 Separation of stored explosive material.

56.6101 Areas around explosive material storage facilities.

56.6102 Explosive material storage practices.

56.6130 Explosive material storage facilities.

56.6131 Location of explosive material storage facilities.

56.6132 Magazine requirements.

56.6133 Powder chests.

##### TRANSPORTATION

56.6200 Delivery to storage or blast site areas.

56.6201 Separation of transported explosive material.

56.6202 Vehicles.

56.6203 Locomotives.

56.6204 Hoists.

56.6205 Conveying explosives by hand.

##### USE

56.6300 Control of blasting operations.

56.6301 Blasthole obstruction check.

56.6302 Separation of explosive material.

56.6303 Initiation preparation.

56.6304 Primer protection.

56.6305 Unused explosive material.

56.6306 Loading, blasting, and security.

56.6307 Drill stem loading.

56.6308 Initiation systems.

56.6309 Fuel oil requirements for ANFO.

56.6310 Misfire waiting period.

56.6311 Handling of misfires.

56.6312 Secondary blasting.

##### ELECTRIC BLASTING

56.6400 Compatibility of electric detonators.

56.6401 Shunting.

56.6402 Deenergized circuits near detonators.

56.6403 Branch circuits.

56.6404 Separation of blasting circuits from power source.

56.6405 Firing devices.

56.6406 Duration of current flow.

56.6407 Circuit testing.

##### NONELECTRIC BLASTING

56.6500 Damaged initiating material.

56.6501 Nonelectric initiation systems.

56.6502 Safety fuse.

##### EXTRANEOUS ELECTRICITY

56.6600 Loading practices.

56.6601 Grounding.

56.6602 Static electricity dissipation during loading.

56.6603 Air gap.

56.6604 Precautions during storms.

56.6605 Isolation of blasting circuits.

##### EQUIPMENT/TOOLS

56.6700 Nonsparking tools.

56.6701 Tamping and loading pole requirements.

##### MAINTENANCE

56.6800 Storage facilities.

56.6801 Vehicle repair.

56.6802 Bulk delivery vehicles.

56.6803 Blasting lines.

##### GENERAL REQUIREMENTS

56.6900 Damaged or deteriorated explosive material.

56.6901 Black powder.

56.6902 Excessive temperatures.

56.6903 Burning explosive material.

56.6904 Smoking and open flames.

57.6905 Protection of explosive material.

#### Subpart E—Explosives

##### § 56.6000 Definitions.

The following definitions apply in this subpart.

**Attended.** Presence of an individual or continuous monitoring to prevent unauthorized entry or access.

**Barrier.** A material object, or objects that separates, keeps apart, or demarcates in a conspicuous manner such as cones, a warning sign, or tape.

**Blast area.** The area in which concussion (shock wave), flying material, or gases from an explosion may cause injury to persons. In determining the blast area, the following factors shall be considered:

- (1) Geology or material to be blasted.
- (2) Blast pattern.
- (3) Burden, depth, diameter, and angle of the holes.
- (4) Blasting experience of the mine.
- (5) Delay system, powder factor, and pounds per delay.
- (6) Type and amount of explosive material.

(7) Type and amount of stemming.

**Blast site.** The area where explosive material is handled during loading, including the perimeter formed by the loaded blastholes and 50 feet (15.2 meters) in all directions from loaded holes. A minimum distance of 30 feet (9.1 meters) may replace the 50-foot (15.2-meter) requirement if the perimeter of loaded holes is demarcated with a barrier. The 50-foot (15.2-meter) and alternative 30-foot (9.1-meter)

requirements also apply in all directions along the full depth of the hole.

**Blasting agent.** Any substance classified as a blasting agent by the Department of Transportation in 49 CFR 173.114a(a). This document is available at any MSHA Metal and Nonmetal Safety and Health district office.

**Detonating cord.** A flexible cord containing a center core of high explosives which may be used to initiate other explosives.

**Detonator.** Any device containing a detonating charge used to initiate an explosive. These devices include electric or nonelectric instantaneous or delay blasting caps and delay connectors. The term "detonator" does not include detonating cord. Detonators may be either "Class A" detonators or "Class C" detonators, as classified by the Department of Transportation in 49 CFR 173.53, and 173.100. This document is available at any MSHA Metal and Nonmetal Safety and Health district office.

**Emulsion.** An explosive material containing substantial amounts of oxidizers dissolved in water droplets, surrounded by an immiscible fuel.

**Explosive.** Any substance classified as an explosive by the Department of Transportation in 49 CFR 173.53, 173.88, and 173.100. This document is available at any MSHA Metal and Nonmetal Safety and Health district office.

**Explosive material.** Explosives, blasting agents, and detonators.

**Flash point.** The minimum temperature at which sufficient vapor is released by a liquid to form a flammable vapor-air mixture near the surface of the liquid.

**Igniter cord.** A fuse that burns progressively along its length with an external flame at the zone of burning, used for lighting a series of safety fuses in a desired sequence.

**Laminated partition.** A partition composed of the following material and minimum nominal dimensions: 1/2-inch-thick plywood, 1/2-inch-thick gypsum wallboard, 1/8-inch-thick low carbon steel, and 1/4-inch-thick plywood, bonded together in that order (IME-22 Box). A laminated partition also includes alternative construction materials described in the Institute of Makers of Explosives (IME) Safety Library Publication No. 22, "Recommendations for the Safe Transportation of Detonators in a Vehicle with other Explosive Materials," (May 1993), and the "Generic Loading Guide for the IME-22 Container," (October 1993). This incorporation by reference has been approved by the Director of the Federal

Register in accordance with 5 U.S.C. 552(a) and 1 CFR part 51. Copies are available at MSHA, 4015 Wilson Boulevard, Room 728, Arlington, VA 22203, and at all Metal and Nonmetal Mine Safety and Health district offices, or available for inspection at the Office of the Federal Register, 800 North Capitol Street, NW., 7th Floor, suite 700, Washington, DC.

**Loading.** Placing explosive material either in a blasthole or against the material to be blasted.

**Magazine.** A bullet-resistant, theft-resistant, fire-resistant, weather-resistant, ventilated facility for the storage of explosives and detonators (BATF Type 1 or Type 2 facility).

**Misfire.** The complete or partial failure of explosive material to detonate as planned. The term also is used to describe the explosive material itself that has failed to detonate.

**Multipurpose dry-chemical fire extinguisher.** An extinguisher having a rating of at least 2-A:10-B:C and containing a nominal 4.5 pounds or more of dry-chemical agent.

**Primer.** A unit, package, or cartridge of explosives which contains a detonator and is used to initiate other explosives or blasting agents.

**Safety switch.** A switch that provides shunt protection in blasting circuits between the blast site and the switch used to connect a power source to the blasting circuit.

**Slurry.** An explosive material containing substantial portions of a liquid, oxidizers, and fuel, plus a thickener.

**Storage facility.** The entire class of structures used to store explosive materials. A "storage facility" used to store blasting agents corresponds to a BATF Type 4 or 5 storage facility.

**Water gel.** An explosive material containing substantial portions of water, oxidizers, and fuel, plus a cross-linking agent.

## STORAGE

### § 56.6100 Separation of stored explosive material.

(a) Detonators shall not be stored in the same magazine with other explosive material.

(b) When stored in the same magazine, blasting agents shall be separated from explosives, safety fuse, and detonating cord to prevent contamination.

### § 56.6101 Areas around explosive material storage facilities.

(a) Areas surrounding storage facilities for explosive material shall be clear of rubbish, brush, dry grass, and trees for 25 feet in all directions, except

that live trees 10 feet or taller need not be removed.

(b) Other combustibles shall not be stored or allowed to accumulate within 50 feet of explosive material. Combustible liquids shall be stored in a manner that ensures drainage will occur away from the explosive material storage facility in case of tank rupture.

### § 56.6102 Explosive material storage practices.

(a) Explosive material shall be—

(1) Stored in a manner to facilitate use of oldest stocks first;

(2) Stored according to brand and grade in such a manner as to facilitate identification; and

(3) Stacked in a stable manner but not more than 8 feet high.

(b) Explosives and detonators shall be stored in closed nonconductive containers except that nonelectric detonating devices may be stored on nonconductive racks provided the case-insert instructions and the date-plant-shift code are maintained with the product.

### § 56.6130 Explosive material storage facilities.

(a) Detonators and explosives shall be stored in magazines.

(b) Packaged blasting agents shall be stored in a magazine or other facility which is ventilated to prevent dampness and excessive heating, weather-resistant, and locked or attended. Drop trailers do not have to be ventilated if they are currently licensed by the Federal, State, or local authorities for over-the-road use. Facilities other than magazines used to store blasting agents shall contain only blasting agents.

(c) Bulk blasting agents shall be stored in weather-resistant bins or tanks which are locked, attended, or otherwise inaccessible to unauthorized entry.

(d) Facilities, bins or tanks shall be posted with the appropriate United States Department of Transportation placards or other appropriate warning signs that indicate the contents and are visible from each approach.

### § 56.6131 Location of explosive material storage facilities.

(a) Storage facilities for any explosive material shall be—

(1) Located so that the forces generated by a storage facility explosion will not create a hazard to occupants in mine buildings and will not damage dams or electric substations; and

(2) Detached structures located outside the blast area and a sufficient distance from powerlines so that the powerlines, if damaged, would not contact the magazines.



(b) Operators should also be aware of regulations affecting storage facilities in 27 CFR part 55, in particular, 27 CFR 55.218 and 55.220. This document is available at any MSHA Metal and Nonmetal Safety and Health district office.

**§ 56.6132 Magazine requirements.**

- (a) Magazines shall be—
- (1) Structurally sound;
  - (2) Noncombustible or the exterior covered with fire-resistant material;
  - (3) Bullet resistant;
  - (4) Made of nonsparking material on the inside;
  - (5) Ventilated to control dampness and excessive heating within the magazine;
  - (6) Posted with the appropriate United States Department of Transportation placards or other appropriate warning signs that indicate the contents and are visible from each approach, so located that a bullet passing through any of the signs will not strike the magazine;
  - (7) Kept clean and dry inside;
  - (8) Unlighted or lighted by devices that are specifically designed for use in magazines and which do not create a fire or explosion hazard;
  - (9) Unheated or heated only with devices that do not create a fire or explosion hazard;
  - (10) Locked when unattended; and
  - (11) Used exclusively for the storage of explosive material except for essential nonsparking equipment used for the operation of the magazine.

(b) Metal magazines shall be equipped with electrical bonding connections between all conductive portions so the entire structure is at the same electrical potential. Suitable electrical bonding methods include welding, riveting, or the use of securely tightened bolts where individual metal portions are joined. Conductive portions of nonmetal magazines shall be grounded.

(c) Electrical switches and outlets shall be located on the outside of the magazine.

**§ 56.6133 Powder chests.**

- (a) Powder chests (day boxes) shall be—
- (1) Structurally sound, weather-resistant, equipped with a lid or cover, and with only nonsparking material on the inside;
  - (2) Posted with the appropriate United States Department of Transportation placards or other appropriate warning signs that indicate the contents and are visible from each approach;
  - (3) Located out of the blast area once loading has been completed;

(4) Locked or attended when containing explosive material; and

(5) Emptied at the end of each shift with the contents returned to a magazine or other storage facility, or attended.

(b) Detonators shall be kept in chests separate from explosives or blasting agents, unless separated by 4-inches of hardwood or equivalent, or a laminated partition. When a laminated partition is used, operators must follow the provisions of the Institute of Makers of Explosives (IME) Safety Library Publication No. 22, "Recommendations for the Safe Transportation of Detonators in a Vehicle with other Explosive Materials," (May 1993), and the "Generic Loading Guide for the IME-22 Container," (October 1993). This incorporation by reference has been approved by the Director of the Federal Register in accordance with 5 U.S.C. 552(a) and 1 CFR part 51. Copies are available at MSHA, 4015 Wilson Boulevard, Room 728, Arlington, VA 22203, and at all Metal and Nonmetal Mine Safety and Health district offices, or available for inspection at the Office of the Federal Register, 800 North Capitol Street, NW., 7th Floor, suite 700, Washington, DC.

**TRANSPORTATION**

**§ 56.6200 Delivery to storage or blast site areas.**

Explosive material shall be transported without undue delay to the storage area or blast site.

**§ 56.6201 Separation of transported explosive material.**

Detonators shall not be transported on the same vehicle or conveyance with other explosives except as follows:

(a) Detonators in quantities of more than 1000 may be transported in a vehicle or conveyance with explosives or blasting agents provided the detonators are—

- (1) Maintained in the original packaging as shipped from the manufacturer; and
- (2) Separated from explosives or blasting agents by 4-inches of hardwood or equivalent, or a laminated partition. The hardwood or equivalent shall be fastened to the vehicle or conveyance. When a laminated partition is used, operators must follow the provisions of the Institute of Makers of Explosives (IME) Safety Library Publication No. 22, "Recommendations for the Safe Transportation of Detonators in a Vehicle with other Explosive Materials," (May 1993), and the "Generic Loading Guide for the IME-22 Container," (October 1993). This incorporation by reference has been

approved by the Director of the Federal Register in accordance with 5 U.S.C. 552(a) and 1 CFR part 51. Copies are available at MSHA, 4015 Wilson Boulevard, Room 728, Arlington, VA 22203, and at all Metal and Nonmetal Mine Safety and Health district offices, or available for inspection at the Office of the Federal Register, 800 North Capitol Street, NW., 7th Floor, suite 700, Washington, DC.

(b) Detonators in quantities of 1000 or fewer may be transported with explosives or blasting agents provided the detonators are—

- (1) Kept in closed containers; and
- (2) Separated from explosives or blasting agents by 4-inches of hardwood or equivalent, or a laminated partition. The hardwood or equivalent shall be fastened to the vehicle or conveyance. When a laminated partition is used, operators must follow the provisions of IME Safety Library Publication No. 22, "Recommendations for the Safe Transportation of Detonators in a Vehicle with other Explosive Materials," (May 1993), and the "Generic Loading Guide for the IME-22 Container," (October 1993). This incorporation by reference has been approved by the Director of the Federal Register in accordance with 5 U.S.C. 552(a) and 1 CFR part 51. Copies are available at MSHA, 4015 Wilson Boulevard, Room 728, Arlington, VA 22203, and at all Metal and Nonmetal Mine Safety and Health district offices, or available for inspection at the Office of the Federal Register, 800 North Capitol Street, NW., 7th Floor, suite 700, Washington, DC.

**§ 56.6202 Vehicles.**

(a) Vehicles containing explosive material shall be—

- (1) Maintained in good condition and shall comply with the requirements of subpart M of this part;
- (2) Equipped with sides and enclosures higher than the explosive material being transported or have the explosive material secured to a nonconductive pallet;
- (3) Equipped with a cargo space that shall contain the explosive material (passenger areas shall not be considered cargo space);
- (4) Equipped with at least two multipurpose dry-chemical fire extinguishers or one such extinguisher and an automatic fire suppression system;
- (5) Posted with warning signs that indicate the contents and are visible from each approach;
- (6) Occupied only by persons necessary for handling the explosive material;

(7) Attended or the cargo compartment locked, except when parked at the blast site and loading is in progress; and

(8) Secured while parked by having—

(i) The brakes set;

(ii) The wheels chocked if movement could occur; and

(iii) The engine shut off unless powering a device being used in the loading operation.

(b) Vehicles containing explosives shall have—

(1) No sparking material exposed in the cargo space; and

(2) Only properly secured nonsparking equipment in the cargo space with the explosives.

(c) Vehicles used for dispensing bulk explosive material shall—

(1) Have no zinc or copper exposed in the cargo space; and

(2) Provide any enclosed screw-type conveyors with protection against internal pressure and frictional heat.

#### **§ 56.6203 Locomotives.**

Explosive material shall not be transported on a locomotive. When explosive material is hauled by trolley locomotive, covered, electrically insulated cars shall be used.

#### **§ 56.6204 Hoists.**

(a) Before explosive material is transported in hoist conveyances, the hoist operator shall be notified.

(b) Explosive material transported in hoist conveyances shall be placed within a container which prevents shifting of the cargo that could cause detonation of the container by impact or by sparks. The manufacturer's container may be used if secured to a nonconductive pallet. When explosives are transported, they shall be secured so as not to contact any sparking material.

(c) No explosive material shall be transported during a mantrip.

#### **§ 56.6205 Conveying explosives by hand.**

Closed, nonconductive containers shall be used to carry explosives and detonators to and from blast sites. Separate containers shall be used for explosives and detonators.

#### **USE**

#### **§ 56.6300 Control of blasting operations.**

(a) Only persons trained and experienced in the handling and use of explosive material shall direct blasting operations and related activities.

(b) Trainees and inexperienced persons shall work only in the immediate presence of persons trained and experienced in the handling and use of explosive material.

#### **§ 56.6301 Blasthole obstruction check.**

Before loading, blastholes shall be checked and, wherever possible, cleared of obstructions.

#### **§ 56.6302 Separation of explosive material.**

Explosives and blasting agents shall be kept separated from detonators until loading begins.

#### **§ 56.6303 Initiation preparation.**

(a) Primers shall be made up only at the time of use and as close to the blast site as conditions allow.

(b) Primers shall be prepared with the detonator contained securely and completely within the explosive or contained securely and appropriately for its design in the tunnel or cap well.

(c) When using detonating cord to initiate another explosive, a connection shall be prepared with the detonating cord threaded through, attached securely to, or otherwise in contact with the explosive.

#### **§ 56.6304 Primer protection.**

(a) Tamping shall not be done directly on a primer.

(b) Rigid cartridges of explosives or blasting agents that are 4 inches (100 millimeters) in diameter or larger shall not be dropped on the primer except where the blasthole contains sufficient depth of water to protect the primer from impact. Slit packages of prill, water gel, or emulsions are not considered rigid cartridges and may be drop loaded.

#### **§ 56.6305 Unused explosive material.**

Unused explosive material shall be moved to a protected location as soon as practical after loading operations are completed.

#### **§ 56.6306 Loading, blasting, and security.**

(a) When explosive materials or initiating systems are brought to the blast site, the blast site shall be attended; barricaded and posted with warning signs, such as "Danger," "Explosives," or "Keep Out;" or flagged against unauthorized entry.

(b) Vehicles and equipment shall not be driven over explosive material or initiating systems in a manner which could contact the material or systems, or create other hazards.

(c) Once loading begins, the only activities permitted within the blast site shall be those activities directly related to the blasting operation and the activities of surveying, stemming, sampling of geology, and reopening of holes, provided that reasonable care is exercised. Haulage activity is permitted near the base of a highwall being loaded or awaiting firing, provided no other haulage access exists.

(d) Loading and blasting shall be conducted in a manner designed to facilitate a continuous process, with the blast fired as soon as possible following the completion of loading. If blasting a loaded round may be delayed for more than 72 hours, the operator shall notify the appropriate MSHA district office.

(e) In electric blasting prior to connecting to the power source, and in nonelectric blasting prior to attaching an initiating device, all persons shall leave the blast area except persons in a blasting shelter or other location that protects them from concussion (shock wave), flying material, and gases.

(f) Before firing a blast—

(1) Ample warning shall be given to allow all persons to be evacuated;

(2) Clear exit routes shall be provided for persons firing the round; and

(3) All access routes to the blast area shall be guarded or barricaded to prevent the passage of persons or vehicles.

(g) Work shall not resume in the blast area until a post-blast examination addressing potential blast-related hazards has been conducted by a person with the ability and experience to perform the examination.

#### **§ 56.6307 Drill stem loading.**

Explosive material shall not be loaded into blastholes with drill stem equipment or other devices that could be extracted while containing explosive material. The use of loading hose, collar sleeves, or collar pipes is permitted.

#### **§ 56.6308 Initiation systems.**

Initiation systems shall be used in accordance with the manufacturer's instructions.

#### **§ 56.6309 Fuel oil requirements for ANFO.**

(a) Liquid hydrocarbon fuels with flash points lower than that of No. 2 diesel oil (125 °F) shall not be used to prepare ammonium nitrate-fuel oil, except that diesel fuels with flash points no lower than 100 °F may be used at ambient air temperatures below 45 °F.

(b) Waste oil, including crankcase oil, shall not be used to prepare ammonium nitrate-fuel oil.

#### **§ 56.6310 Misfire waiting period.**

When a misfire is suspected, persons shall not enter the blast area—

(a) For 30 minutes if safety fuse and blasting caps are used; or

(b) For 15 minutes if any other type detonators are used.

#### **§ 56.6311 Handling of misfires.**

(a) Faces and muck piles shall be examined for misfires after each blasting operation.

(b) Only work necessary to remove a misfire and protect the safety of miners engaged in the removal shall be permitted in the affected area until the misfire is disposed of in a safe manner.

(c) When a misfire cannot be disposed of safely, each approach to the area affected by the misfire shall be posted with a warning sign at a conspicuous location to prohibit entry, and the condition shall be reported immediately to mine management.

(d) Misfires occurring during the shift shall be reported to mine management not later than the end of the shift.

#### **§ 56.6312 Secondary blasting.**

Secondary blasts fired at the same time in the same work area shall be initiated from one source.

#### **ELECTRIC BLASTING**

##### **§ 56.6400 Compatibility of electric detonators.**

All electric detonators to be fired in a round shall be from the same manufacturer and shall have similar electrical firing characteristics.

##### **§ 56.6401 Shunting.**

Except during testing—

(a) Electric detonators shall be kept shunted until connected to the blasting line or wired into a blasting round;

(b) Wired rounds shall be kept shunted until connected to the blasting line; and

(c) Blasting lines shall be kept shunted until immediately before blasting.

##### **§ 56.6402 Deenergized circuits near detonators.**

Electrical distribution circuits within 50 feet of electric detonators at the blast site shall be deenergized. Such circuits need not be deenergized between 25 to 50 feet of the electric detonators if stray current tests, conducted as frequently as necessary, indicate a maximum stray current of less than 0.05 amperes through a 1-ohm resistor as measured at the blast site.

##### **§ 56.6403 Branch circuits.**

(a) If electric blasting includes the use of branch circuits, each branch shall be equipped with a safety switch or equivalent method to isolate the circuits to be used.

(b) At least one safety switch or equivalent method of protection shall be located outside the blast area and shall be in the open position until persons are withdrawn.

##### **§ 56.6404 Separation of blasting circuits from power source.**

(a) Switches used to connect the power source to a blasting circuit shall

be locked in the open position except when closed to fire the blast.

(b) Lead wires shall not be connected to the blasting switch until the shot is ready to be fired.

##### **§ 56.6405 Firing devices.**

(a) Power sources shall be capable of delivering sufficient current to energize all electric detonators to be fired with the type of circuits used. Storage or dry cell batteries are not permitted as power sources.

(b) Blasting machines shall be tested, repaired, and maintained in accordance with manufacturer's instructions.

(c) Only the blaster shall have the key or other control to an electrical firing device.

##### **§ 56.6406 Duration of current flow.**

If any part of a blast is connected in parallel and is to be initiated from powerlines or lighting circuits, the time of current flow shall be limited to a maximum of 25 milliseconds. This can be accomplished by incorporating an arcing control device in the blasting circuit or by interrupting the circuit with an explosive device attached to one or both lead lines and initiated by a 25-millisecond delay electric detonator.

##### **§ 56.6407 Circuit testing.**

A blasting galvanometer or other instrument designed for testing blasting circuits shall be used to test each of the following:

(a) Continuity of each electric detonator in the blasthole prior to stemming and connection to the blasting line.

(b) Resistance of individual series or the resistance of multiple balanced series to be connected in parallel prior to their connection to the blasting line.

(c) Continuity of blasting lines prior to the connection of electric detonator series.

(d) Total blasting circuit resistance prior to connection to the power source.

#### **NONELECTRIC BLASTING**

##### **§ 56.6500 Damaged initiating material.**

A visual check of the completed circuit shall be made to ensure that the components are properly aligned and connected. Safety fuse, igniter cord, detonating cord, shock or gas tubing, and similar material which is kinked, bent sharply, or damaged shall not be used.

##### **§ 56.6501 Nonelectric initiation systems.**

(a) When the nonelectric initiation system uses shock tube—

(1) Connections with other initiation devices shall be secured in a manner

which provides for uninterrupted propagation;

(2) Factory-made units shall be used as assembled and shall not be cut except that a single splice is permitted on the lead-in trunkline during dry conditions; and

(3) Connections between blastholes shall not be made until immediately prior to clearing the blast site when surface delay detonators are used.

(b) When the nonelectric initiation system uses detonating cord—

(1) The line of detonating cord extending out of a blasthole shall be cut from the supply spool immediately after the attached explosive is correctly positioned in the hole;

(2) In multiple row blasts, the trunkline layout shall be designed so that the detonation can reach each blasthole from at least two directions;

(3) Connections shall be tight and kept at right angles to the trunkline;

(4) Detonators shall be attached securely to the side of the detonating cord and pointed in the direction in which detonation is to proceed;

(5) Connections between blastholes shall not be made until immediately prior to clearing the blast site when surface delay detonators are used; and

(6) Lead-in lines shall be manually unreel if connected to the trunklines at the blast site.

(c) When the nonelectric initiation system uses gas tube, continuity of the circuit shall be tested prior to blasting.

##### **§ 56.6502 Safety fuse.**

(a) The burning rate of each spool of safety fuse to be used shall be measured, posted in locations which will be conspicuous to safety fuse users, and brought to the attention of all persons involved with the blasting operation.

(b) When firing with safety fuse ignited individually using handheld lighters, the safety fuse shall be of lengths which provide at least the minimum burning time for a particular size round, as specified in the following table:

TABLE E-1.—SAFETY FUSE—MINIMUM BURNING TIME

Number of holes in a round	Minimum burning time
1 .....	2 min. <sup>1</sup>
2-5 .....	2 min. 40 sec.
6-10 .....	3 min. 20 sec.
11 to 15 .....	5 min.

<sup>1</sup>For example, at least a 36-inch length of 40-second-per-foot safety fuse or at least a 48-inch length of 30-second-per-foot safety fuse would have to be used to allow sufficient time to evacuate the area.

(c) Where flyrock might damage exposed safety fuse, the blast shall be timed so that all safety fuses are burning within the blastholes before any blasthole detonates.

(d) Fuse shall be cut and capped in dry locations.

(e) Blasting caps shall be crimped to fuse only with implements designed for that purpose.

(f) Safety fuse shall be ignited only after the primer and the explosive material are securely in place.

(g) Safety fuse shall be ignited only with devices designed for that purpose. Carbide lights, liquefied petroleum gas torches, and cigarette lighters shall not be used to light safety fuse.

(h) At least two persons shall be present when lighting safety fuse, and no one shall light more than 15 individual fuses. If more than 15 holes per person are to be fired, electric initiation systems, igniter cord and connectors, or other nonelectric initiation systems shall be used.

#### EXTRANEOUS ELECTRICITY

##### § 56.6600 Loading practices.

If extraneous electricity is suspected in an area where electric detonators are used, loading shall be suspended until tests determine that stray current does not exceed 0.05 amperes through a 1-ohm resistor when measured at the location of the electric detonators. If greater levels of extraneous electricity are found, the source shall be determined and no loading shall take place until the condition is corrected.

##### § 56.6601 Grounding.

Electric blasting circuits, including powerline sources when used, shall not be grounded.

##### § 56.6602 Static electricity dissipation during loading.

When explosive material is loaded pneumatically into a blasthole in a manner that generates a static electricity hazard—

(a) An evaluation of the potential static electricity hazard shall be made and any hazard shall be eliminated before loading begins;

(b) The loading hose shall be of a semiconductive type, have a total of not more than 2 megohms of resistance over its entire length and not less than 1000 ohms of resistance per foot;

(c) Wire-counteracted hoses shall not be used;

(d) Conductive parts of the loading equipment shall be bonded and grounded and grounds shall not be made to other potential sources of extraneous electricity; and

(e) Plastic tubes shall not be used as hole liners if the hole contains an electric detonator.

##### § 56.6603 Air gap.

At least a 15-foot air gap shall be provided between the blasting circuit and the electric power source.

##### § 56.6604 Precautions during storms.

During the approach and progress of an electrical storm, blasting operations shall be suspended and persons withdrawn from the blast area or to a safe location.

##### § 56.6605 Isolation of blasting circuits.

Lead wires and blasting lines shall be isolated and insulated from power conductors, pipelines, and railroad tracks, and shall be protected from sources of stray or static electricity. Blasting circuits shall be protected from any contact between firing lines and overhead powerlines which could result from the force of a blast.

#### EQUIPMENT/TOOLS

##### § 56.6700 Nonsparking tools.

Only nonsparking tools shall be used to open containers of explosive material or to punch holes in explosive cartridges.

##### § 56.6701 Tamping and loading pole requirements.

Tamping and loading poles shall be of wood or other nonconductive, nonsparking material. Couplings for poles shall be nonsparking.

#### MAINTENANCE

##### § 56.6800 Storage facilities.

When repair work which could produce a spark or flame is to be performed on a storage facility—

(a) The explosive material shall be moved to another facility, or moved at least 50 feet from the repair activity and monitored; and

(b) The facility shall be cleaned to prevent accidental detonation.

##### § 56.6801 Vehicle repair.

Vehicles containing explosive material and oxidizers shall not be taken into a repair garage or shop.

##### § 56.6802 Bulk delivery vehicles.

No welding or cutting shall be performed on a bulk delivery vehicle until the vehicle has been washed down and all explosive material has been removed. Before welding or cutting on a hollow shaft, the shaft shall be thoroughly cleaned inside and out and vented with a minimum 1/2-inch diameter opening to allow for sufficient ventilation.

##### § 56.6803 Blasting lines.

Permanent blasting lines shall be properly supported. All blasting lines shall be insulated and kept in good repair.

#### GENERAL REQUIREMENTS

##### § 56.6900 Damaged or deteriorated explosive material.

Damaged or deteriorated explosive material shall be disposed of in a safe manner in accordance with the instructions of the manufacturer.

##### § 56.6901 Black powder.

(a) Black powder shall be used for blasting only when a desired result cannot be obtained with another type of explosive, such as in quarrying certain types of dimension stone.

(b) Containers of black powder shall be—

- (1) Nonsparking;
- (2) Kept in a totally enclosed cargo space while being transported by a vehicle;
- (3) Securely closed at all times when—

(i) Within 50 feet of any magazine or open flame;

(ii) Within any building in which a fuel-fired or exposed-element electric heater is operating; or

(iii) In an area where electrical or incandescent-particle sparks could result in powder ignition; and

(4) Opened only when the powder is being transferred to a blasthole or another container and only in locations not listed in paragraph (b)(3) of this section.

(c) Black powder shall be transferred from containers only by pouring.

(d) Spills shall be cleaned up promptly with nonsparking equipment. Contaminated powder shall be put into a container of water and shall be disposed of promptly after the granules have disintegrated, or the spill area shall be flushed promptly with water until the granules have disintegrated completely.

(e) Misfires shall be disposed of by washing the stemming and powder charge from the blasthole, and removing and disposing of the initiator in accordance with the requirement for damaged explosives.

(f) Holes shall not be reloaded for at least 12 hours when the blastholes have failed to break as planned.

##### § 56.6902 Excessive temperatures.

(a) Where heat could cause premature detonation, explosive material shall not be loaded into hot areas, such as kilns or sprung holes.

(b) When blasting sulfide ores where hot holes occur that may react with

explosive material in blastholes, operators shall—

(1) Measure an appropriate number of blasthole temperatures in order to assess the specific mine conditions prior to the introduction of explosive material;

(2) Limit the time between the completion of loading and the initiation of the blast to no more than 12 hours; and

(3) Take other special precautions to address the specific conditions at the mine to prevent premature detonation.

#### **§ 56.6903 Burning explosive material.**

If explosive material is suspected of burning at the blast site, persons shall be evacuated from the endangered area and shall not return for at least one hour after the burning or suspected burning has stopped.

#### **§ 56.6904 Smoking and open flames.**

Smoking and use of open flames shall not be permitted within 50 feet of explosive material except when separated by permanent noncombustible barriers. This standard does not apply to devices designed to ignite safety fuse or to heating devices which do not create a fire or explosion hazard.

#### **§ 56.6905 Protection of explosive material.**

(a) Explosive material shall be protected from temperatures in excess of 150 degrees Fahrenheit.

(b) Explosive material shall be protected from impact, except for tamping and dropping during loading.

### **PART 57—[AMENDED]**

1. The authority citation for part 57 is revised to read as follows:

Authority: 30 U.S.C. 811.

2. Effective September 10, 1996, subpart E of part 57 is revised to read as follows:

#### **Subpart E—Explosives**

Sec.

57.6000 Definitions.

STORAGE—SURFACE AND UNDERGROUND

57.6100 Separation of stored explosive material.

57.6101 Areas around explosive material storage facilities.

57.6102 Explosive material storage practices.

STORAGE—SURFACE ONLY

57.6130 Explosive material storage facilities.

57.6131 Location of explosive material storage facilities.

57.6132 Magazine requirements.

57.6133 Powder chests.

STORAGE—UNDERGROUND ONLY

57.6160 Main facilities.

57.6161 Auxiliary facilities.

TRANSPORTATION—SURFACE AND UNDERGROUND

57.6200 Delivery to storage or blast site areas.

57.6201 Separation of transported explosive material.

57.6202 Vehicles.

57.6203 Locomotives.

57.6204 Hoists.

57.6205 Conveying explosives by hand.

USE—SURFACE AND UNDERGROUND

57.6300 Control of blasting operations.

57.6301 Blasthole obstruction check.

57.6302 Separation of explosive material.

57.6303 Initiation preparation.

57.6304 Primer protection.

57.6305 Unused explosive material.

57.6306 Loading, blasting, and security.

57.6307 Drill stem loading.

57.6308 Initiation systems.

57.6309 Fuel oil requirements for ANFO.

57.6310 Misfire waiting period.

57.6311 Handling of misfires.

57.6312 Secondary blasting.

ELECTRIC BLASTING—SURFACE AND UNDERGROUND

57.6400 Compatibility of electric detonators.

57.6401 Shunting.

57.6402 Deenergized circuits near detonators.

57.6403 Branch circuits.

57.6404 Separation of blasting circuits from power source.

57.6405 Firing devices.

57.6406 Duration of current flow.

57.6407 Circuit testing.

NONELECTRIC BLASTING—SURFACE AND UNDERGROUND

57.6500 Damaged initiating material.

57.6501 Nonelectric initiation systems.

57.6502 Safety fuse.

EXTRANEIOUS ELECTRICITY—SURFACE AND UNDERGROUND

57.6600 Loading practices.

57.6601 Grounding.

57.6602 Static electricity dissipation during loading.

57.6603 Air gap.

57.6604 Precautions during storms.

57.6605 Isolation of blasting circuits.

EQUIPMENT/TOOLS—SURFACE AND UNDERGROUND

57.6700 Nonsparking tools.

57.6701 Tamping and loading pole requirements.

MAINTENANCE—SURFACE AND UNDERGROUND

57.6800 Storage facilities.

57.6801 Vehicle repair.

57.6802 Bulk delivery vehicles.

57.6803 Blasting lines.

GENERAL REQUIREMENTS—SURFACE AND UNDERGROUND

57.6900 Damaged or deteriorated explosive material.

57.6901 Black powder.

57.6902 Excessive temperatures.

57.6903 Burning explosive material.

57.6904 Smoking and open flames.

57.6905 Protection of explosive material.

GENERAL REQUIREMENTS—UNDERGROUND ONLY

57.6960 Mixing of explosive material.

### **Subpart E—Explosives**

#### **§ 57.6000 Definitions.**

The following definitions apply in this subpart.

*Attended.* Presence of an individual or continuous monitoring to prevent unauthorized entry or access. In addition, areas containing explosive material at underground areas of a mine can be considered attended when all access to the underground areas of the mine is secured from unauthorized entry. Vertical shafts shall be considered secure. Inclined shafts or adits shall be considered secure when locked at the surface.

*Barrier.* A material object, or objects that separates, keeps apart, or demarcates in a conspicuous manner such as cones, a warning sign, or tape.

*Blast area.* The area in which concussion (shock wave), flying material, or gases from an explosion may cause injury to persons. In determining the blast area, the following factors shall be considered:

- (1) Geology or material to be blasted.
- (2) Blast pattern.
- (3) Burden, depth, diameter, and angle of the holes.
- (4) Blasting experience of the mine.
- (5) Delay system, powder factor, and pounds per delay.
- (6) Type and amount of explosive material.

(7) Type and amount of stemming.

*Blast site.* The area where explosive material is handled during loading, including the perimeter formed by the loaded blastholes and 50 feet (15.2 meters) in all directions from loaded holes. A minimum distance of 30 feet (9.1 meters) may replace the 50-foot (15.2-meter) requirement if the perimeter of loaded holes is demarcated with a barrier. The 50-foot (15.2-meter) and alternative 30-foot (9.1-meter) requirements also apply in all directions along the full depth of the hole. In underground mines, at least 15 feet (4.6 meters) of solid rib, pillar, or broken rock can be substituted for the 50-foot (15.2-meter) distance. In underground mines utilizing a block-caving system or similar system, at least 6 feet (1.8 meters) of solid rib or pillar, including concrete reinforcement of at least 10 inches (254 millimeters), with overall dimensions of not less than 6 feet (1.8 meters), may be substituted for the 50-foot (15.2-meter) distance requirement.

*Blasting agent.* Any substance classified as a blasting agent by the Department of Transportation in 49 CFR

173.114a(a). This document is available at any MSHA Metal and Nonmetal Safety and Health district office.

**Detonating cord.** A flexible cord containing a center core of high explosives which may be used to initiate other explosives.

**Detonator.** Any device containing a detonating charge used to initiate an explosive. These devices include electric or nonelectric instantaneous or delay blasting caps, and delay connectors. The term "detonator" does not include detonating cord. Detonators may be either "Class A" detonators or "Class C" detonators, as classified by the Department of Transportation in 49 CFR 173.53, and 173.100. This document is available at any MSHA Metal and Nonmetal Safety and Health district office.

**Emulsion.** An explosive material containing substantial amounts of oxidizers dissolved in water droplets, surrounded by an immiscible fuel.

**Explosive.** Any substance classified as an explosive by the Department of Transportation in 49 CFR 173.53, 173.88, and 173.100. This document is available at any MSHA Metal and Nonmetal Safety and Health district office.

**Explosive material.** Explosives, blasting agents, and detonators.

**Flash point.** The minimum temperature at which sufficient vapor is released by a liquid to form a flammable vapor-air mixture near the surface of the liquid.

**Igniter cord.** A fuse that burns progressively along its length with an external flame at the zone of burning, used for lighting a series of safety fuses in a desired sequence.

**Laminated partition.** A partition composed of the following material and minimum nominal dimensions: 1/2-inch-thick plywood, 1/2-inch-thick gypsum wallboard, 1/8-inch-thick low carbon steel, and 1/4-inch-thick plywood, bonded together in that order (IME-22 Box). A laminated partition also includes alternative construction materials described in the Institute of Makers of Explosives (IME) Safety Library Publication No. 22, "Recommendations for the Safe Transportation of Detonators in a Vehicle with other Explosive Materials," (May 1993), and the "Generic Loading Guide for the IME-22 Container," (October 1993). This incorporation by reference has been approved by the Director of the Federal Register in accordance with 5 U.S.C. 552(a) and 1 CFR part 51. Copies are available at MSHA, 4015 Wilson Boulevard, Room 728, Arlington, VA 22203, and at all Metal and Nonmetal

Mine Safety and Health district offices, or available for inspection at the Office of the Federal Register, 800 North Capitol Street NW., 7th Floor, suite 700, Washington, DC.

**Loading.** Placing explosive material either in a blasthole or against the material to be blasted.

**Magazine.** A bullet-resistant, theft-resistant, fire-resistant, weather-resistant, ventilated facility for the storage of explosives and detonators (BATF Type 1 or Type 2 facility).

**Misfire.** The complete or partial failure of explosive material to detonate as planned. The term also is used to describe the explosive material itself that has failed to detonate.

**Multipurpose dry-chemical fire extinguisher.** An extinguisher having a rating of at least 2-A:10-B:C and containing a nominal 4.5 pounds or more of dry-chemical agent.

**Primer.** A unit, package, or cartridge of explosives which contains a detonator and is used to initiate other explosives or blasting agents.

**Safety switch.** A switch that provides shunt protection in blasting circuits between the blast site and the switch used to connect a power source to the blasting circuit.

**Slurry.** An explosive material containing substantial portions of a liquid, oxidizers, and fuel, plus a thickener.

**Storage facility.** The entire class of structures used to store explosive materials. A "storage facility" used to store blasting agents corresponds to a BATF Type 4 or 5 storage facility.

**Water gel.** An explosive material containing substantial portions of water, oxidizers, and fuel, plus a cross-linking agent.

#### STORAGE—SURFACE AND UNDERGROUND

##### § 57.6100 Separation of stored explosive material.

(a) Detonators shall not be stored in the same magazine with other explosive material.

(b) When stored in the same magazine, blasting agents shall be separated from explosives, safety fuse, and detonating cord to prevent contamination.

##### § 57.6101 Areas around explosive material storage facilities.

(a) Areas surrounding storage facilities for explosive material shall be clear of rubbish, brush, dry grass, and trees for 25 feet in all directions, except that live trees 10 feet or taller need not be removed.

(b) Other combustibles shall not be stored or allowed to accumulate within

50 feet of explosive material.

Combustible liquids shall be stored in a manner that ensures drainage will occur away from the explosive material storage facility in case of tank rupture.

##### § 57.6102 Explosive material storage practices.

(a) Explosive material shall be—

(1) Stored in a manner to facilitate use of oldest stocks first;

(2) Stored according to brand and grade in such a manner as to facilitate identification; and

(3) Stacked in a stable manner but not more than 8 feet high.

(b) Explosives and detonators shall be stored in closed nonconductive containers except that nonelectric detonating devices may be stored on nonconductive racks provided the case-insert instructions and the date-plant-shift code are maintained with the product.

#### STORAGE—SURFACE ONLY

##### § 57.6130 Explosive material storage facilities.

(a) Detonators and explosives shall be stored in magazines.

(b) Packaged blasting agents shall be stored in a magazine or other facility which is ventilated to prevent dampness and excessive heating, weather-resistant, and locked or attended. Drop trailers do not have to be ventilated if they are currently licensed by the Federal, State, or local authorities for over-the-road use. Facilities other than magazines used to store blasting agents shall contain only blasting agents.

(c) Bulk blasting agents shall be stored in weather-resistant bins or tanks which are locked, attended, or otherwise inaccessible to unauthorized entry.

(d) Facilities, bins or tanks shall be posted with the appropriate United States Department of Transportation placards or other appropriate warning signs that indicate the contents and are visible from each approach.

##### § 57.6131 Location of explosive material storage facilities.

(a) Storage facilities for any explosive material shall be—

(1) Located so that the forces generated by a storage facility explosion will not create a hazard to occupants in mine buildings and will not damage dams or electric substations; and

(2) Detached structures located outside the blast area and a sufficient distance from powerlines so that the powerlines, if damaged, would not contact the magazines.

(b) Operators should also be aware of regulations affecting storage facilities in 27 CFR part 55, in particular, 27 CFR

55.218 and 55.220. This document is available at any MSHA Metal and Nonmetal Safety and Health district office.

**§ 57.6132 Magazine requirements.**

- (a) Magazines shall be—
  - (1) Structurally sound;
  - (2) Noncombustible or the exterior covered with fire-resistant material;
  - (3) Bullet resistant;
  - (4) Made of nonsparking material on the inside;
  - (5) Ventilated to control dampness and excessive heating within the magazine;
  - (6) Posted with the appropriate United States Department of Transportation placards or other appropriate warning signs that indicate the contents and are visible from each approach, so located that a bullet passing through any of the signs will not strike the magazine;
  - (7) Kept clean and dry inside;
  - (8) Unlighted or lighted by devices that are specifically designed for use in magazines and which do not create a fire or explosion hazard;
  - (9) Unheated or heated only with devices that do not create a fire or explosion hazard;
  - (10) Locked when unattended; and
  - (11) Used exclusively for the storage of explosive material except for essential nonsparking equipment used for the operation of the magazine.
- (b) Metal magazines shall be equipped with electrical bonding connections between all conductive portions so the entire structure is at the same electrical potential. Suitable electrical bonding methods include welding, riveting, or the use of securely tightened bolts where individual metal portions are joined. Conductive portions of nonmetal magazines shall be grounded.
- (c) Electrical switches and outlets shall be located on the outside of the magazine.

**§ 57.6133 Powder chests.**

- (a) Powder chests (day boxes) shall be—
  - (1) Structurally sound, weather-resistant, equipped with a lid or cover, and with only nonsparking material on the inside;
  - (2) Posted with the appropriate United States Department of Transportation placards or other appropriate warning signs that indicate the contents and are visible from each approach;
  - (3) Located out of the blast area once loading has been completed;
  - (4) Locked or attended when containing explosive material; and
  - (5) Emptied at the end of each shift with the contents returned to a

magazine or other storage facility, or attended.

(b) Detonators shall be kept in chests separate from explosives or blasting agents, unless separated by 4-inches of hardwood or equivalent, or a laminated partition. When a laminated partition is used, operators must follow the provisions of the Institute of Makers of Explosives (IME) Safety Library Publication No. 22, (May 1993), "Recommendations for the Safe Transportation of Detonators in a Vehicle with other Explosive Materials," (May 1993), and the "Generic Loading Guide for the IME-22 Container," (October 1993). This incorporation by reference has been approved by the Director of the Federal Register in accordance with 5 U.S.C. 552(a) and 1 CFR part 51. Copies are available at MSHA, 4015 Wilson Boulevard, Room 728, Arlington, VA 22203, and at all Metal and Nonmetal Mine Safety and Health district offices, or available for inspection at the Office of the Federal Register, 800 North Capitol Street NW., 7th Floor, suite 700, Washington, DC.

**STORAGE—UNDERGROUND ONLY**

**§ 57.6160 Main facilities.**

- (a) Main facilities used to store explosive material underground shall be located—
  - (1) In stable or supported ground;
  - (2) So that a fire or explosion in the storage facilities will not prevent escape from the mine, or cause detonation of the contents of another storage facility;
  - (3) Out of the line of blasts, and protected from vehicular traffic, except that accessing the facility;
  - (4) At least 200 feet from work places or shafts;
  - (5) At least 50 feet from electric substations;
  - (6) A safe distance from trolley wires; and
  - (7) At least 25 feet from detonator storage facilities.
- (b) Main facilities used to store explosive material underground shall be—
  - (1) Posted with warning signs that indicate the contents and are visible from any approach;
  - (2) Used exclusively for the storage of explosive material and necessary equipment associated with explosive material storage and delivery:
    - (i) Portions of the facility used for the storage of explosives shall only contain nonsparking material or equipment.
    - (ii) The blasting agent portion of the facility may be used for the storage of other necessary equipment;
  - (3) Kept clean, suitably dry, and orderly;

(4) Provided with unobstructed ventilation openings;

(5) Kept securely locked unless all access to the mine is either locked or attended; and

(6) Unlighted or lighted only with devices that do not create a fire or explosion hazard and which are specifically designed for use in magazines.

(c) Electrical switches and outlets shall be located outside the facility.

**§ 57.6161 Auxiliary facilities.**

(a) Auxiliary facilities used to store explosive material near work places shall be wooden, box-type containers equipped with covers or doors, or facilities constructed or mined-out to provide equivalent impact resistance and confinement.

(b) The auxiliary facilities shall be—

- (1) Constructed of nonsparking material on the inside when used for the storage of explosives;
- (2) Kept clean, suitably dry, and orderly;
- (3) Kept in repair;
- (4) Located out of the line of blasts so they will not be subjected to damaging shock or flyrock;
- (5) Identified with warning signs or coded to indicate the contents with markings visible from any approach;
- (6) Located at least 15 feet from all haulageways and electrical equipment, or placed entirely within a mined-out recess in the rib used exclusively for explosive material;
- (7) Filled with no more than a one-week supply of explosive material;
- (8) Separated by at least 25 feet from other facilities used to store detonators; and
- (9) Kept securely locked unless all access to the mine is either locked or attended.

**TRANSPORTATION—SURFACE AND UNDERGROUND**

**§ 57.6200 Delivery to storage or blast site areas.**

Explosive material shall be transported without undue delay to the storage area or blast site.

**§ 57.6201 Separation of transported explosive material.**

Detonators shall not be transported on the same vehicle or conveyance with other explosives except as follows:

(a) Detonators in quantities of more than 1,000 may be transported in a vehicle or conveyance with explosives or blasting agents provided the detonators are—

- (1) Maintained in the original packaging as shipped from the manufacturer; and

(2) Separated from explosives or blasting agents by 4 inches of hardwood or equivalent, or a laminated partition. The hardwood or equivalent shall be fastened to the vehicle or conveyance. When a laminated partition is used, operators must follow the provisions of the Institute of Makers of Explosives (IME) Safety Library Publication No. 22, "Recommendations for the Safe Transportation of Detonators in a Vehicle with other Explosive Materials" (May 1993), and the "Generic Loading Guide for the IME-22 Container" (October 1993). This incorporation by reference has been approved by the Director of the Federal Register in accordance with 5 U.S.C. 552(a) and 1 CFR part 51. Copies are available at MSHA, 4015 Wilson Boulevard, Room 728, Arlington, VA 22203, and at all Metal and Nonmetal Mine Safety and Health district offices, or available for examination at the Office of the Federal Register, 800 North Capitol Street NW., 7th Floor, suite 700, Washington, DC.

(b) Detonators in quantities of 1,000 or fewer may be transported with explosives or blasting agents provided the detonators are—

- (1) Kept in closed containers; and
- (2) Separated from explosives or blasting agents by 4 inches of hardwood or equivalent, or a laminated partition. The hardwood or equivalent shall be fastened to the vehicle or conveyance. When a laminated partition is used, operators must follow the provisions of IME Safety Library Publication No. 22, "Recommendations for the Safe Transportation of Detonators in a Vehicle with other Explosive Materials" (May 1993), and the "Generic Loading Guide for the IME-22 Container" (October 1993). This incorporation by reference has been approved by the Director of the Federal Register in accordance with 5 U.S.C. 552(a) and 1 CFR part 51. Copies are available at MSHA, 4015 Wilson Boulevard, Room 728, Arlington, VA 22203, and at all Metal and Nonmetal Mine Safety and Health district offices, or available for examination at the Office of the Federal Register, 800 North Capitol Street NW., 7th Floor, suite 700, Washington, DC.

#### **§ 57.6202 Vehicles.**

- (a) Vehicles containing explosive material shall be—
- (1) Maintained in good condition and shall comply with the requirements of subpart M of this part;
  - (2) Equipped with sides and enclosures higher than the explosive material being transported or have the explosive material secured to a nonconductive pallet;

(3) Equipped with a cargo space that shall contain the explosive material (passenger areas shall not be considered cargo space);

(4) Equipped with at least two multipurpose dry-chemical fire extinguishers or one such extinguisher and an automatic fire suppression system;

(5) Posted with warning signs that indicate the contents and are visible from each approach;

(6) Occupied only by persons necessary for handling the explosive material;

(7) Attended or the cargo compartment locked at surface areas of underground mines, except when parked at the blast site and loading is in progress; and

(8) Secured while parked by having—

- (i) The brakes set;
- (ii) The wheels chocked if movement could occur; and
- (iii) The engine shut off unless powering a device being used in the loading operation.

(b) Vehicles containing explosives shall have—

- (1) No sparking material exposed in the cargo space; and
- (2) Only properly secured nonsparking equipment in the cargo space with the explosives.

(c) Vehicles used for dispensing bulk explosive material shall—

- (1) Have no zinc or copper exposed in the cargo space; and
- (2) Provide any enclosed screw-type conveyors with protection against internal pressure and frictional heat.

#### **§ 57.6203 Locomotives.**

Explosive material shall not be transported on a locomotive. When explosive material is hauled by trolley locomotive, covered, electrically insulated cars shall be used.

#### **§ 57.6204 Hoists.**

(a) Before explosive material is transported in hoist conveyances—

- (1) The hoist operator shall be notified; and
- (2) Hoisting in adjacent shaft compartments, except for empty conveyances or counterweights, shall be stopped until transportation of the explosive material is completed.

(b) Explosive material transported in hoist conveyances shall be placed within a container which prevents shifting of the cargo that could cause detonation of the container by impact or by sparks. The manufacturer's container may be used if secured to a nonconductive pallet. When explosives are transported, they shall be secured so as not to contact any sparking material.

(c) No explosive material shall be transported during a mantrip.

#### **§ 57.6205 Conveying explosives by hand.**

Closed, nonconductive containers shall be used to carry explosives and detonators to and from blast sites. Separate containers shall be used for explosives and detonators.

#### **USE—SURFACE AND UNDERGROUND**

#### **§ 57.6300 Control of blasting operations.**

(a) Only persons trained and experienced in the handling and use of explosive material shall direct blasting operations and related activities.

(b) Trainees and inexperienced persons shall work only in the immediate presence of persons trained and experienced in the handling and use of explosive material.

#### **§ 57.6301 Blasthole obstruction check.**

Before loading, blastholes shall be checked and, wherever possible, cleared of obstructions.

#### **§ 57.6302 Separation of explosive material.**

Explosives and blasting agents shall be kept separated from detonators until loading begins.

#### **§ 57.6303 Initiation preparation.**

(a) Primers shall be made up only at the time of use and as close to the blast site as conditions allow.

(b) Primers shall be prepared with the detonator contained securely and completely within the explosive or contained securely and appropriately for its design in the tunnel or cap well.

(c) When using detonating cord to initiate another explosive, a connection shall be prepared with the detonating cord threaded through, attached securely to, or otherwise in contact with the explosive.

#### **§ 57.6304 Primer protection.**

(a) Tamping shall not be done directly on a primer.

(b) Rigid cartridges of explosives or blasting agents that are 4 inches (100 millimeters) in diameter or larger shall not be dropped on the primer except where the blasthole contains sufficient depth of water to protect the primer from impact. Slit packages of prill, water gel, or emulsions are not considered rigid cartridges and may be drop loaded.

#### **§ 57.6305 Unused explosive material.**

Unused explosive material shall be moved to a protected location as soon as practical after loading operations are completed.



**§ 57.6306 Loading, blasting, and security.**

(a) When explosive materials or initiating systems are brought to the blast site, the blast site shall be attended; barricaded and posted with warning signs, such as "Danger," "Explosives," or "Keep Out;" or flagged against unauthorized entry.

(b) Vehicles and equipment shall not be driven over explosive material or initiating systems in a manner which could contact the material or system, or create other hazards.

(c) Once loading begins, the only activities permitted within the blast site shall be those activities directly related to the blasting operation and the activities of surveying, stemming, sampling of geology, and reopening of holes, provided that reasonable care is exercised. Haulage activity is permitted near the base of bench faces being loaded or awaiting firing, provided no other haulage access exists.

(d) Loading and blasting shall be conducted in a manner designed to facilitate a continuous process, with the blast fired as soon as possible following the completion of loading. If blasting a loaded round may be delayed for more than 72 hours, the operator shall notify the appropriate MSHA district office.

(e) In electric blasting prior to connecting to the power source, and in nonelectric blasting prior to attaching an initiating device, all persons shall leave the blast area except persons in a blasting shelter or other location that protects them from concussion (shock wave), flying material, and gases.

(f) Before firing a blast—

(1) Ample warning shall be given to allow all persons to be evacuated;

(2) Clear exit routes shall be provided for persons firing the round; and

(3) All access routes to the blast area shall be guarded or barricaded to prevent the passage of persons or vehicles.

(g) Work shall not be resumed in the blast area until a post-blast examination addressing potential blast-related hazards has been conducted by a person with the ability and experience to perform the examination.

**§ 57.6307 Drill stem loading.**

Explosive material shall not be loaded into blastholes with drill stem equipment or other devices that could be extracted while containing explosive material. The use of loading hose, collar sleeves, or collar pipes is permitted.

**§ 57.6308 Initiation systems.**

Initiation systems shall be used in accordance with the manufacturer's instructions.

**§ 57.6309 Fuel oil requirements for ANFO.**

(a) Liquid hydrocarbon fuels with flash points lower than that of No. 2 diesel oil (125 °F) shall not be used to prepare ammonium nitrate-fuel oil, except that diesel fuels with flash points no lower than 100 °F may be used at ambient air temperatures below 45 °F.

(b) Waste oil, including crankcase oil, shall not be used to prepare ammonium nitrate-fuel oil.

**§ 57.6310 Misfire waiting period.**

When a misfire is suspected, persons shall not enter the blast area—

(a) For 30 minutes if safety fuse and blasting caps are used; or

(b) For 15 minutes if any other type detonators are used.

**§ 57.6311 Handling of misfires.**

(a) Faces and muck piles shall be examined for misfires after each blasting operation.

(b) Only work necessary to remove a misfire and protect the safety of miners engaged in the removal shall be permitted in the affected area until the misfire is disposed of in a safe manner.

(c) When a misfire cannot be disposed of safely, each approach to the area affected by the misfire shall be posted with a warning sign at a conspicuous location to prohibit entry, and the condition shall be reported immediately to mine management.

(d) Misfires occurring during the shift shall be reported to mine management not later than the end of the shift.

**§ 57.6312 Secondary blasting.**

Secondary blasts fired at the same time in the same work area shall be initiated from one source.

**ELECTRIC BLASTING—SURFACE AND UNDERGROUND****§ 57.6400 Compatibility of electric detonators.**

All electric detonators to be fired in a round shall be from the same manufacturer and shall have similar electrical firing characteristics.

**§ 57.6401 Shunting.**

Except during testing—

(a) Electric detonators shall be kept shunted until connected to the blasting line or wired into a blasting round;

(b) Wired rounds shall be kept shunted until connected to the blasting line; and

(c) Blasting lines shall be kept shunted until immediately before blasting.

**§ 57.6402 Deenergized circuits near detonators.**

Electrical distribution circuits within 50 feet of electric detonators at the blast

site shall be deenergized. Such circuits need not be deenergized between 25 to 50 feet of the electric detonators if stray current tests, conducted as frequently as necessary, indicate a maximum stray current of less than 0.05 ampere through a 1-ohm resistor as measured at the blast site.

**§ 57.6403 Branch circuits.**

(a) If electric blasting includes the use of branch circuits, each branch shall be equipped with a safety switch or equivalent method to isolate the circuits to be used.

(b) At least one safety switch or equivalent method of protection shall be located outside the blast area and shall be in the open position until persons are withdrawn.

**§ 57.6404 Separation of blasting circuits from power source.**

(a) Switches used to connect the power source to a blasting circuit shall be locked in the open position except when closed to fire the blast.

(b) Lead wires shall not be connected to the blasting switch until the shot is ready to be fired.

**§ 57.6405 Firing devices.**

(a) Power sources shall be capable of delivering sufficient current to energize all electric detonators to be fired with the type of circuits used. Storage or dry cell batteries are not permitted as power sources.

(b) Blasting machines shall be tested, repaired, and maintained in accordance with manufacturer's instructions.

(c) Only the blaster shall have the key or other control to an electrical firing device.

**§ 57.6406 Duration of current flow.**

If any part of a blast is connected in parallel and is to be initiated from powerlines or lighting circuits, the time of current flow shall be limited to a maximum of 25 milliseconds. This can be accomplished by incorporating an arcing control device in the blasting circuit or by interrupting the circuit with an explosive device attached to one or both lead lines and initiated by a 25-millisecond delay electric detonator.

**§ 57.6407 Circuit testing.**

A blasting galvanometer or other instrument designed for testing blasting circuits shall be used to test the following:

(a) In surface operations—

(1) Continuity of each electric detonator in the blasthole prior to stemming and connection to the blasting line;

(2) Resistance of individual series or the resistance of multiple balanced series to be connected in parallel prior to their connection to the blasting line;

(3) Continuity of blasting lines prior to the connection of electric detonator series; and

(4) Total blasting circuit resistance prior to connection to the power source.

(b) In underground operations—

(1) Continuity of each electric detonator series; and

(2) Continuity of blasting lines prior to the connection of electric detonators.

#### NONELECTRIC BLASTING—SURFACE AND UNDERGROUND

##### § 57.6500 Damaged initiating material.

A visual check of the completed circuit shall be made to ensure that the components are properly aligned and connected. Safety fuse, igniter cord, detonating cord, shock or gas tubing, and similar material which is kinked, bent sharply, or damaged shall not be used.

##### § 57.6501 Nonelectric initiation systems.

(a) When the nonelectric initiation system uses shock tube—

(1) Connections with other initiation devices shall be secured in a manner which provides for uninterrupted propagation;

(2) Factory-made units shall be used as assembled and shall not be cut except that a single splice is permitted on the lead-in trunkline during dry conditions; and

(3) Connections between blastholes shall not be made until immediately prior to clearing the blast site when surface delay detonators are used.

(b) When the nonelectric initiation system uses detonating cord—

(1) The line of detonating cord extending out of a blasthole shall be cut from the supply spool immediately after the attached explosive is correctly positioned in the hole;

(2) In multiple row blasts, the trunkline layout shall be designed so that the detonation can reach each blasthole from at least two directions;

(3) Connections shall be tight and kept at right angles to the trunkline;

(4) Detonators shall be attached securely to the side of the detonating cord and pointed in the direction in which detonation is to proceed;

(5) Connections between blastholes shall not be made until immediately prior to clearing the blast site when surface delay detonators are used; and

(6) Lead-in lines shall be manually unreel if connected to the trunklines at the blast site.

(c) When nonelectric initiation systems use gas tube, continuity of the circuit shall be tested prior to blasting.

##### § 57.6502 Safety fuse.

(a) The burning rate of each spool of safety fuse to be used shall be measured, posted in locations which will be conspicuous to safety fuse users, and brought to the attention of all persons involved with the blasting operation.

(b) When firing with safety fuse ignited individually using handheld lighters, the safety fuse shall be of lengths which provide at least the minimum burning time for a particular size round, as specified in the following table:

TABLE E-1.—SAFETY FUSE—MINIMUM BURNING TIME

Number of holes in a round	Minimum burning time
1 .....	2 min. <sup>1</sup>
2-5 .....	2 min. 40 sec.
6-10 .....	3 min. 20 sec.
11 to 15 .....	5 min.

<sup>1</sup> For example, at least a 36-inch length of 40-second-per-foot safety fuse or at least a 48-inch length of 30-second-per-foot safety fuse would have to be used to allow sufficient time to evacuate the area.

(c) Where flyrock might damage exposed safety fuse, the blast shall be timed so that all safety fuses are burning within the blastholes before any blasthole detonates.

(d) Fuse shall be cut and capped in dry locations.

(e) Blasting caps shall be crimped to fuse only with implements designed for that purpose.

(f) Safety fuse shall be ignited only after the primer and the explosive material are securely in place.

(g) Safety fuse shall be ignited only with devices designed for that purpose. Carbide lights, liquefied petroleum gas torches, and cigarette lighters shall not be used to light safety fuse.

(h) At least two persons shall be present when lighting safety fuse, and no one shall light more than 15 individual fuses. If more than 15 holes per person are to be fired, electric initiation systems, igniter cord and connectors, or other nonelectric initiation systems shall be used.

#### EXTRANEEOUS ELECTRICITY—SURFACE AND UNDERGROUND

##### § 57.6600 Loading practices.

If extraneous electricity is suspected in an area where electric detonators are used, loading shall be suspended until tests determine that stray current does not exceed 0.05 amperes through a 1-ohm resistor when measured at the location of the electric detonators. If greater levels of extraneous electricity are found, the source shall be

determined and no loading shall take place until the condition is corrected.

##### § 57.6601 Grounding.

Electric blasting circuits, including powerline sources when used, shall not be grounded.

##### § 57.6602 Static electricity dissipation during loading.

When explosive material is loaded pneumatically into a blasthole in a manner that generates a static electricity hazard—

(a) An evaluation of the potential static electricity hazard shall be made and any hazard shall be eliminated before loading begins;

(b) The loading hose shall be of a semiconductive type, have a total of not more than 2 megohms of resistance over its entire length and not less than 1000 ohms of resistance per foot;

(c) Wire-counter hoses shall not be used;

(d) Conductive parts of the loading equipment shall be bonded and grounded and grounds shall not be made to other potential sources of extraneous electricity; and

(e) Plastic tubes shall not be used as hole liners if the hole contains an electric detonator.

##### § 57.6603 Air gap.

At least a 15-foot air gap shall be provided between the blasting circuit and the electric power source.

##### § 57.6604 Precautions during storms.

During the approach and progress of an electrical storm—

(a) Surface blasting operations shall be suspended and persons withdrawn from the blast area or to a safe location; or

(b) Underground electrical blasting operations that are capable of being initiated by lightning shall be suspended and all persons withdrawn from the blast area or to a safe location.

##### § 57.6605 Isolation of blasting circuits.

Lead wires and blasting lines shall be isolated and insulated from power conductors, pipelines, and railroad tracks, and shall be protected from sources of stray or static electricity. Blasting circuits shall be protected from any contact between firing lines and overhead powerlines which could result from the force of a blast.

#### EQUIPMENT/TOOLS—SURFACE AND UNDERGROUND

##### § 57.6700 Nonsparking tools.

Only nonsparking tools shall be used to open containers of explosive material or to punch holes in explosive cartridges.

**§ 57.6701 Tamping and loading pole requirements.**

Tamping and loading poles shall be of wood or other nonconductive, nonsparking material. Couplings for poles shall be nonsparking.

**MAINTENANCE—SURFACE AND UNDERGROUND****§ 57.6800 Storage facilities.**

When repair work which could produce a spark or flame is to be performed on a storage facility—

(a) The explosive material shall be moved to another facility, or moved at least 50 feet from the repair activity and monitored; and

(b) The facility shall be cleaned to prevent accidental detonation.

**§ 57.6801 Vehicle repair.**

Vehicles containing explosive material and oxidizers shall not be taken into a repair garage or shop.

**§ 57.6802 Bulk delivery vehicles.**

No welding or cutting shall be performed on a bulk delivery vehicle until the vehicle has been washed down and all explosive material has been removed. Before welding or cutting on a hollow shaft, the shaft shall be thoroughly cleaned inside and out and vented with a minimum 1/2-inch diameter opening to allow for sufficient ventilation.

**§ 57.6803 Blasting lines.**

Permanent blasting lines shall be properly supported. All blasting lines shall be insulated and kept in good repair.

**GENERAL REQUIREMENTS—SURFACE AND UNDERGROUND****§ 57.6900 Damaged or deteriorated explosive material.**

Damaged or deteriorated explosive material shall be disposed of in a safe manner in accordance with the instructions of the manufacturer.

**§ 57.6901 Black powder.**

(a) Black powder shall be used for blasting only when a desired result cannot be obtained with another type of explosive, such as in quarrying certain types of dimension stone.

(b) Containers of black powder shall be—

(1) Nonsparking;  
(2) Kept in a totally enclosed cargo space while being transported by a vehicle;

(3) Securely closed at all times when—

(i) Within 50 feet of any magazine or open flame;

(ii) Within any building in which a fuel-fired or exposed-element electric heater is operating; or

(iii) In an area where electrical or incandescent-particle sparks could result in powder ignition; and

(4) Opened only when the powder is being transferred to a blasthole or another container and only in locations not listed in paragraph (b)(3) of this section.

(c) Black powder shall be transferred from containers only by pouring.

(d) Spills shall be cleaned up promptly with nonsparking equipment. Contaminated powder shall be put into a container of water and shall be disposed of promptly after the granules have disintegrated, or the spill area shall be flushed promptly with water until the granules have disintegrated completely.

(e) Misfires shall be disposed of by washing the stemming and powder charge from the blasthole, and removing and disposing of the initiator in accordance with the requirement for damaged explosives.

(f) Holes shall not be reloaded for at least 12 hours when the blastholes have failed to break as planned.

**§ 57.6902 Excessive temperatures.**

(a) Where heat could cause premature detonation, explosive material shall not be loaded into hot areas, such as kilns or sprung holes.

(b) When blasting sulfide ores where hot holes occur that may react with explosive material in blastholes, operators shall—

(1) Measure an appropriate number of blasthole temperatures in order to assess the specific mine conditions prior to the introduction of explosive material;

(2) Limit the time between the completion of loading and the initiation of the blast to no more than 12 hours; and

(3) Take other special precautions to address the specific conditions at the mine to prevent premature detonation.

**§ 57.6903 Burning explosive material.**

If explosive material is suspected of burning at the blast site, persons shall be evacuated from the endangered area and shall not return for at least one hour after the burning or suspected burning has stopped.

**§ 57.6904 Smoking and open flames.**

Smoking and use of open flames shall not be permitted within 50 feet of explosive material except when separated by permanent noncombustible barriers. This standard does not apply to devices designed to ignite safety fuse or to heating devices which do not create a fire or explosion hazard.

**§ 57.6905 Protection of explosive material.**

(a) Explosive material shall be protected from temperatures in excess of 150 degrees Fahrenheit.

(b) Explosive material shall be protected from impact, except for tamping and dropping during loading.

**GENERAL REQUIREMENTS—UNDERGROUND ONLY****§ 57.6960 Mixing of explosive material.**

(a) The mixing of ingredients to produce explosive material shall not be conducted underground unless prior approval of the MSHA district manager is obtained. In granting or withholding approval, the district manager shall consider the potential hazards created by—

(1) The location of the stored material and the storage practices used;

(2) The transportation and use of the explosive material;

(3) The nature of the explosive material, including its sensitivity;

(4) Any other factor deemed relevant to the safety of miners potentially exposed to the hazards associated with the mixing of the bulk explosive material underground.

(b) Storage facilities for the ingredients to be mixed shall provide drainage away from the facilities for leaks and spills.

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